

apical buds of an intact defoliated stem was compared with the total weight of shoots produced from similar stems divided into portions of one node each. From the approximate equivalence of these quantities he concluded that "the polar character of the regeneration of shoots is due to the fact that all the material available for growth reaches the apical and none of the other nodes of a long piece of stem." The relation of this conclusion to LOEB'S well known earlier work on regeneration in *Bryophyllum* is not quite clear to the reviewer, since nothing appears here concerning the effect of a growth-inhibiting hormone by which is to be explained the dominance of the apical and the inhibition of the lateral buds.

Although the reviewer is aware that the two cases are not strictly comparable, it would seem that if inhibition of lateral buds is the effect of a basipetally migrating growth-inhibiting substance, the maximum effect of "pruning" would result from complete isolation of each bud from the deleterious effects of its neighbors, as LOEB was able to do in *Bryophyllum*, and as was impossible in REED'S experiments with the pear. Yet the experiment with *Bryophyllum* resulted in the production of a greater amount of new growth from the intact than from the divided stem.

The arguments in support of the several theories to account for the dominance of the apical portion of a shoot have been reviewed recently by CHILD,³ and several objections to the hypothesis of growth-inhibiting hormones pointed out. It would appear that further progress toward the solution of this problem must wait on more adequate information concerning the anatomical relations of apical and lateral buds, and of tissue changes in regeneration. For instance, the transport efficiency of the vascular supply to the apical as compared with lateral buds does not appear to have been adequately investigated. The relative age of the terminal as compared with other buds is important in this connection. In shoots with the indeterminate growth habit the apical bud may establish its dominant rôle in the axial gradient, which it thereafter retains, in the judgment of CHILD, by virtue of its priority. In shoots of limited apical growth different relations may obtain. Again, if inhibition of a growing tip is a transmission through protoplasmic connections rather than the physical transportation of a substance through the vascular tracts, as CHILD holds on the basis of the behavior of simple animals and non-vascular plants, evidence of cytoplasmic cell connections should be sought in such active portions of the shoot. The effect of callus deposition in the sieve tubes and of changes in the phloem (both sieve tubes and parenchyma) toward lignification should be determined in relation to a possible gradient in transport efficiency from apex to base. The coordination of histological and physiological studies in this problem is greatly to be desired.—FREEMAN WEISS.

The rapprochement in ecology.—A notable feature in the development of ecology has been the marked divergence between the American and Continental

³ Amer. Jour. Bot. 8: 286-295. 1921.

European schools. Continental ecology, developing naturally and by degrees from the older study of floristic plant geography, has retained much of the taxonomic standpoint, and methods for distinguishing, classifying, and arranging vegetational units according to their physiognomy have been very highly developed. In America, on the other hand, and latterly also in the British commonwealths, the tendency has been much more to emphasize the dynamic and genetic aspects, especially under the leadership of COWLES, in the development of the successional idea. The quadrat method of POUND and CLEMENTS, to be sure, was a notable contribution to physiognomic ecology, but CLEMENTS became an early convert to the successional doctrine, and has been one of its most voluminous exponents. Thus the Anglo-Americans and the rest of the world have come to present united and opposing fronts, and the situation has become sufficiently tense to induce the remark from ROMELL,⁴ "Entre divers partis des phytogéographes la divergence grandit, on pourrait déjà dire la lutte s'enflamme." The first part of his statement is true enough, and the latter part could easily have become so, if the one side had been as willing to accept battle as the other was to offer it. It goes without saying that such a situation is a most regrettable one for the science of ecology. It is encouraging therefore to note, in a group of recent Continental papers in ecology,⁵ a markedly increased toleration of the successional-dynamic point of view, as well as indications that physiognomic methods may yet be developed that will not seem too metaphysical in conception and too unwieldy in practice for the American temperament.

RÜBEL's three papers are especially valuable as a comprehensive and highly condensed summary of the progress of ecology. He traces the early growth of the science, from the vague first beginnings with THEOPHRASTUS and the more or less disconnected comment of early modern taxonomic botanists, through its evolution as a subspecies of phytogeography, to its present and independent development. The history of the numerous efforts to arrive

⁴ ROMELL, LARS-GUNNAR, *Physionomistiquie et écologie raisonnée*. *Svensk Botanisk Tidskrift* 14:136-146. 1920.

⁵ RÜBEL, EDUARD, *Anfänge und Ziele der Geobotanik*. *Vierteljahrsschr. Naturf. Gesells. Zürich* 62:629-650. 1917.

———, *Über die Entwicklung der Gesellschaftsmorphologie*. *Jour. Ecol.* 8:18-40. 1920.

———, *Die Entwicklung der Pflanzensoziologie*. *Vierteljahrsschr. Naturf. Gesells. Zürich* 65:573-604. 1920.

BRAUN-BLANQUET, J., *Prinzipien einer Systematik der Pflanzengesellschaften auf floristischer Grundlage*. *Jahrb. St. Gallischen Naturw. Gesells.* 57:305-351. 1921.

FITTING, HANS, *Aufgaben und Ziele einer vergleichenden Physiologie auf geographischer Grundlage*. pp. 42. Jena. 1922.

PALMGREN, ALVAR, *Die Entfernung als pflanzengeographischer Faktor*. *Acta Soc. Fauna et Flora Fennica.* 49:no. 1. 1921.

at some satisfactory method for quantitative estimation of vegetational values is of particular interest. The methods of the earlier workers were heterogenous and often confused. Later methods gained in the matter of clarity of ideas, but were highly complicated and exceedingly laborious. Present day effort is toward simplification, and in this the work of RAUNKIAER and BRAUN-BLANQUET is perhaps most promising. The latter's paper, in addition to the effort toward clarification and simplicity, just mentioned, is notable for its proposal to classify his plants also according to their dynamic value, that is, in American terminology their successional value. He proposes a series of five valuations to be applied to the species in any given association, together with symbols for their convenient designation. His class names, with approximate English equivalents, are *aufbauend* (constructive), *erhaltend* (maintaining), *festigend* (consolidating), *neutral* (neutral), *abbauend*, *zerstörend* (disruptive). The idea of progressive and regressive succession is thus clearly postulated.

The ecological implications in FITTING'S contribution are all the more valid in that they are not directly intended. The author is a physiologist, and his primary concern is the avoidance of the artificial and abnormal conditions imposed on his material by the greenhouse methods of ordinary laboratory practice. He contends that the physiology of plants should be studied where the plants naturally occur, and insists on the study of climatic, edaphic, and biotic factors as they affect the space actually occupied by the plant in the field. This, of course, coincides with the activities of the younger American ecologists who are carrying physiology out of doors.

PALMGREN'S study is one of migration, and thus implies the successional viewpoint throughout; it is the more noteworthy in that it was conducted on the Aland archipelago, almost within sight of Uppsala. These islands, he estimates, have not been emerged for more than 3500 years; moreover, they are high-boreal in position, so that an ecologist with the successional viewpoint can extract much aid and comfort from his conclusions.

All this is gratifying to Americans, but as yet there is not much indication of reciprocity on our part. FULLER and BAKKE anticipated the German publication of RAUNKIAER in making his ideas accessible to the English-reading public, but little or nothing has been done in this country with his methods. Probably most American ecologists feel that still further simplification is needed. RAUNKIAER himself admits that his methods involve a good deal of labor. Then there is also the element of time; it generally takes about two graduate "generations" to establish a new idea.—FRANK THONE.

Stomatal regulation.—Using LLOYD'S methods of studying stomata, which he thinks have been criticized without sufficient reason, LOFTFIELD⁶ has made

⁶ LOFTFIELD, J. V. G., The behavior of stomata. Carnegie Publ. no. 314. pp. 104. 1921.